The 70-Year Assumption

Probabilistic Modeling and New Data on Exposure Duration

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The 70-Year Assumption

One critical element of cancer risk assessment is the estimate of how many years an exposure will last - the "exposure duration." Individuals vary greatly in how long they live or work in one area, so a variability *distribution* is needed to fully characterize exposures. EPA's Exposure Factors Handbook presents such distributions, and they can be used in probabilistic models to predict how risk will vary across a population. In fact, local, site-specific distributions of exposure duration would be ideal, but these are rarely estimated because of a lack of readily available data or tools. Instead, analysts often use default point estimates such as 70 or 30 years in place of local information on actual exposure duration.

Do We Need Better Estimates?

Some risk metrics are sensitive to duration assumptions, others are not, and some require high-end estimates while others depend on average values:

- MIR (max. individual risk) or other 'high-end' metric – need high-end estimate
- Total population risk, or # of cases – need avg. lifespan
- Risk to average person, or the number of people above a given risk threshold – very sensitive to duration assumptions and needs average, not high-end value.

EPA's Workgroup

In 2004, EPA assembled a cross-office workgroup to review exposure duration assumptions in the context of the air toxics residual risk program. This group brought together analysts from the Office of Research and Development (ORD), Office of Air and Radiation (OAR), and OPEI. The group has also contacted academics and the Bureau of Census to draw upon further expertise in residential mobility survey data.

Through regular online conferences, the group reviewed exposure duration information currently used by EPA, collected updated data, examined completely new types of data, and constructed Monte Carlo and regression models and graphical tools to improve the state of science in this area.

The result will be new models and tools providing updated, more accurate, and localized estimates of residential exposure duration.

Preliminary Findings

1. Exposure duration assumptions have substantial impacts on risk estimates.
2. The 70-year assumption greatly overestimates the average American's residential duration (perhaps by a factor of 6).
3. The Exposure Factors Handbook estimates of exposure duration were based on 1987 data. Updated data significantly change these estimates.
4. Improvements to the methodology originally used to predict these durations should be considered, because the model does not explain upper-percentile durations reported in Census data.
5. Local moving rates vary greatly, so localized estimates can be very different from national averages. Models are now available that could provide localized distributions of residential duration, and EPA is developing this capability.
6. The group has also examined other complicating factors that should be considered, such as the large fraction of residential moves that are within-county. Some moves, but not all, will reduce a person's exposure to the stationary source in question.